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10/575,586	04/11/2006	Udo Van Stevendaal	DE03049	9550

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EXAMINER	
CORBETT, JOHN M	
ART UNIT	PAPER NUMBER
2882	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/575,586	VAN STEVENDAAL ET AL.	
	Examiner	Art Unit	
	JOHN M. CORBETT	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 April 2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11 April 2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☒ Other: *IDS: 25 September 2007*.

DETAILED ACTION

Specification

1. The specification is objected to because it refers to claims 1-13 on pages 2-5, which may create discrepancies and new matter issues if future claim amendments were to be made. Therefore, the examiner suggests removing all references to the claims that are in the specification.

Appropriate correction is required.

2. The incorporation of essential material in the specification by reference foreign application, DE 10252662.1, and to a publication, Kak et al. in "Principles of Computerized Tomographic Imaging" (IEEE, New York, 1988), is improper. Applicant is required to amend the disclosure to include the material incorporated by reference, if the material is relied upon to overcome any objection, rejection, or other requirement imposed by the Office. The amendment must be accompanied by a statement executed by the applicant, or a practitioner representing the applicant, stating that the material being inserted is the material previously incorporated by reference and that the amendment contains no new matter. 37 CFR 1.57(f). Additionally, it is noted by the Examiner that the above referenced foreign application and publication and other publications cited in the specification have not been submitted in accordance with 37 CFR 1.97 and 1.98 and therefore have not been considered.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: In figure 9, items 51-55. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claims 1-13 are objected to because of the following informalities, which appear to be minor draft errors including grammatical and/or lack of antecedent basis problems.

In the following format (location of objection; suggestion for correction), the following correction(s) may obviate the objection(s):

(Claim 1, line 1, "CSCT" was claimed, perhaps "Coherent Scatter Computer Tomography (CSCT)" was meant).

(Claim 1, line 3, "procession" was claimed, perhaps "processing" was meant).

(Claim 5, line 1, "CSCT" was claimed, perhaps "Coherent Scatter Computer Tomography (CSCT)" was meant).

(Claim 8, line 1, "CSCT" was claimed, perhaps "Coherent Scatter Computer Tomography (CSCT)" was meant).

(Claim 12, line 6, "detector;" was claimed, perhaps "detector; and" was meant).

(Claim 13, line 2, "CSCT" was claimed, perhaps "Coherent Scatter Computer Tomography (CSCT)" was meant).

Claims 2-4, 6-7 and 9-12 are objected to by virtue of their dependency.

Note: The first instance of an abbreviation used in a claim should explicitly state the term or phrase which is being abbreviated.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefore, subject to the conditions and requirements of this title.

5. Claims 8-13 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

With regards to claims 8-12, the claims are directed to a judicial exception; as such, pursuant to the Interim Guidelines on the Patent Eligible Subject Matter (MPEP 2106), the claims must have either physical transformation and/or a useful, concrete and tangible result. The

claims fail to include transformation from one physical state to another. Although, the claims appear useful and concrete, there does not appear to be a tangible result claimed. The step of merely performing a backprojection is not sufficient to constitute a tangible result, since the outcome of the subjecting step has not been used in a disclosed practical application nor made available in such a manner that its usefulness in a disclosed practical application can be realized. As such, the subject matter of the claims is not patent eligible.

An example, which would make the subject matter of the instant claims 8-12 statutory, would be to include a step of displaying a reconstructed image.

With regards to claim 13, the claim is drawn to a computer program per se. A computer program per se is a set of abstract instructions. Therefore, a computer program is not a physical thing (product) nor a process as they are not "acts" being performed. As such, these claims are not directed to one of the statutory categories of the invention (See MPEP 2106.01), but directed to nonstatutory functional descriptive material.

It is noted that computer programs embodied on a computer readable medium or other structure, which would permit the functionality of the program to be realized, would be directed to a product and be within a statutory category of invention, so long as the computer readable medium is not disclosed as non-statutory matter per se (signals or carrier waves or presented over a network such as the Worldwide Web).

An example that would make the instant claims statutory would be to claim a computer readable medium encoded with a computer program which, when implemented on the data

processor, instructs the data processor to perform the desired method steps. Hence, the claims would be directed to statutory subject matter.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harding (6,470,067) in view of Van Stevendaal et al. ("Filtered Back-Projection Reconstruction Technique for Coherent-Scatter Computed Tomography", 15 May 2003, Medical Imaging 2003: Image Processing, SPIE Volume 5032, pages 1810-1819).

With respect to claim 1, Harding teaches a data processing device (10) for performing a reconstruction of Coherent Scatter Computer Tomography (CSCT) data (Abstract), wherein the CSCT data comprises a spectrum acquired by means of an energy resolving detector element (Col. 4, lines 35-38 and Figures 1 and 3), the data processing device comprising:

a memory for storing the CSCT data (computer 10 has memory); and

a data processor for performing a filtered back-projection, wherein the data processor is adapted to perform the following operation:

determining a wave-vector transfer by using the first readouts (Col. 4, lines 17-38);

determining a reconstruction volume (view angle, fan angle and momentum transfer of scattering points); and

wherein a dimension of the reconstruction volume is determined by the wave-vector transfer (momentum transfer of scattering points).

Harding fails to disclose wherein the wave-vector transfer represents curved lines in the reconstruction volume; and

performing a filtered back-projection along the curved lines in the reconstruction volume.

Van Stevendaal et al. teaches wherein the wave-vector transfer represents curved lines in the reconstruction volume (Page 2468, Col. 2, lines 26-28 and Figures 3 and 4) and

performing a filtered back-projection along the curved lines in the reconstruction volume (Title and Abstract, lines 4-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Harding to include the curved filtered back-projection of Van Stevendaal et al., since a person would have been motivated to make such a modification to reduce computational time and improve imaging by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

With respect to claim 2, Harding further discloses wherein the spectrum is acquired during a circular acquisition where a source of radiation is rotated around an object of interest in a rotation plane (Col. 3, lines 65-67 and Figure 1).

With respect to claim 3, Harding further discloses wherein the reconstruction volume is furthermore determined by two linear independent vectors of the rotation plane (view angle and fan angle of scattering points).

With respect to claim 4, Harding as modified above suggests the device as recited above. Harding further discloses wherein the energy resolving detector is arranged such that it measures a scatter radiation scattered by an object of interest (Col. 4, lines 1-4 and Figures 1 and 3); and

wherein the CSCT data further comprises information with respect to a primary radiation attenuated by the object of interest (Col. 4, lines 1-4).

Harding fails to explicitly disclose wherein a preprocessing is performed to correct for an attenuation contribution.

Van Stevendaal et al. teaches wherein a preprocessing is performed to correct for an attenuation contribution (Page 2468, Section II B. Preprocessing).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the device of Harding as modified above the attenuation correction of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve image quality by correcting for the intensity residual primary beam at a scattering point to be reconstructed that is essential for applying the reconstruction algorithm (Page 2466, Col. 1, lines 10-12) as taught by Van Stevendaal et al.

With respect to claim 5, Harding discloses a Coherent Scatter Computer Tomography (CSCT) (Abstract) apparatus (Figure 1) for examination of an object of interest (13), the CSCT apparatus comprising:

a detector unit with an x-ray source and a scatter radiation detector (Figure 1);

wherein the scatter radiation detector is arranged at the detector unit opposite to the x-ray source with an offset with respect to the slice plane (Figure 1);

wherein first detector element is an energy-resolving detector element (Col. 4, lines 35-38 and Figures 1 and 3);

a data processor (10) for performing a filtered back-projection on first readouts of the scatter radiation detector, wherein the data processor is adapted to perform the following operation:

determining a wave-vector transfer by using the first readouts (Col. 4, lines 17-38);

determining a reconstruction volume (view angle, fan angle and momentum transfer of scattering points); and

wherein a dimension of the reconstruction volume is determined by the wave-vector transfer (momentum transfer of scattering points).

Harding fails to disclose wherein the wave-vector transfer represents curved lines in the reconstruction volume; and

performing a filtered back-projection along the curved lines in the reconstruction volume.

Van Stevendaal et al. teaches wherein the wave-vector transfer represents curved lines in the reconstruction volume (Page 2468, Col. 2, lines 26-28 and Figures 3 and 4) and

performing a filtered back-projection along the curved lines in the reconstruction volume (Title and Abstract, lines 4-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Harding to include the curved filtered back-projection of Van Stevendaal et al., since a person would have been motivated to make such a modification to reduce computational time and improve imaging by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

With respect to claim 6, Harding as modified above suggests the apparatus as recited above. Harding further discloses wherein the scatter radiation detector is arranged at the detector unit opposite to the x-ray source parallel to the slice plane and out of the slice plane with such an offset along the rotational axis such that the scatter radiation detector is arranged for receiving a scatter radiation scattered from the object of interest (Figures 1 and 3), and wherein the CSCT apparatus further comprises:

a primary radiation detector (160);

wherein the primary radiation detector is arranged at the detector unit opposite to the x-ray source in the slice plane for receiving a primary radiation attenuated by the object of interest (Col. 4, lines 1-4).

Harding fails to explicitly disclose a preprocessing to correct for an attenuation contribution by using second readouts of the primary radiation detector.

Van Stevendaal et al. teaches a preprocessing to correct for an attenuation contribution by using second readouts of the primary radiation detector (Page 2468, Section II B. Preprocessing).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the apparatus of Harding as modified above the attenuation correction of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve image quality by correcting for the intensity residual primary beam at a scattering point to be reconstructed that is essential for applying the reconstruction algorithm (Page 2466, Col. 1, lines 10-12) as taught by Van Stevendaal et al.

With respect to claim 7, Harding further discloses wherein the reconstruction volume is furthermore determined by two linear independent vectors of the rotation plane and a wave-vector transfer dimension (view angle and fan angle of scattering points).

With respect to claim 8, Harding teaches a method of performing a reconstruction of Coherent Scatter Computer Tomography (CSCT) data (Abstract), wherein the CSCT data comprises a spectrum acquired by means of an energy resolving detector element (Col. 4, lines 17-38 and Figures 1 and 3), the method comprising the steps of:

determining a wave-vector transfer by using the first readouts (Col. 4, lines 17-38);

determining a reconstruction volume (view angle, fan angle and momentum transfer of scattering points); and

wherein a dimension of the reconstruction volume is determined by the wave-vector transfer (momentum transfer of scattering points).

Harding fails to disclose wherein the wave-vector transfer represents curved lines in the reconstruction volume; and

performing a filtered back-projection along the curved lines in the reconstruction volume.

Van Stevendaal et al. teaches wherein the wave-vector transfer represents curved lines in the reconstruction volume (Page 2468, Col. 2, lines 26-28 and Figures 3 and 4) and

performing a filtered back-projection along the curved lines in the reconstruction volume (Title and Abstract, lines 4-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Harding to include the curved filtered back-projection of Van Stevendaal et al., since a person would have been motivated to make such a modification to reduce computational time and improve imaging by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

With respect to claim 9, Harding further discloses wherein the spectrum is acquired during a circular acquisition where a source of radiation is rotated around an object of interest in a rotation plane (Col. 3, lines 65-67 and Figure 1).

With respect to claim 10, Harding further discloses wherein the reconstruction volume is furthermore determined by two linear independent vectors of the rotation plane (view angle and fan angle of scattering points).

With respect to claim 11, Harding as modified above suggests the method as recited above. Harding further discloses wherein the energy resolving detector is arranged such that it measures a scatter radiation scattered by an object of interest (Col. 4, lines 1-4 and Figures 1 and 3); and

wherein the CSCT data further comprises information with respect to a primary radiation attenuated by the object of interest (Col. 4, lines 1-4).

Harding fails to explicitly disclose wherein a preprocessing is performed to correct for an attenuation contribution.

Van Stevendaal et al. teaches wherein a preprocessing is performed to correct for an attenuation contribution (Page 2468, Section II B. Preprocessing).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Harding as modified above the attenuation correction of Van Stevendaal et al., since a person would have been motivated to make such a modification to improve image quality by correcting for the intensity residual primary beam at a scattering point to be reconstructed that is essential for applying the reconstruction algorithm (Page 2466, Col. 1, lines 10-12) as taught by Van Stevendaal et al.

With respect to claim 12, Harding further discloses the steps of:

energizing an x-ray source (s) such that it generates a fan-shaped x-ray beam (41) which penetrates the object of interest in an examination area in a slice plane (Figure 1);

performing an integral energy measurement of a scatter radiation by means of a scatter radiation detector (Col. 4, lines 34-38, sum of measurements of each energy measured is an

integral energy measurement) with a first detector line with a plurality of first energy resolving detector elements arranged in a line (Figures 1 and 3);

reading-out the energy measurement from the scatter radiation detector (Col. 3, lines 47-53); and

rotating the x-ray source and the scatter radiation detector around a rotational axis extending through an examination area containing the object of interest (Col. 3, lines 65-67 and Figure 1).

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harding in view of Van Stevendaal et al. and Hsieh (6,529,575).

With respect to claim 13, Harding teaches a data processor (10) for performing a reconstruction of Coherent Scatter Computer Tomography (CSCT) data (Abstract), wherein the CSCT data comprises a spectrum acquired by means of an energy resolving detector element (Col. 4, lines 35-38 and Figures 1 and 3), the data processing device comprising:

a memory for storing the CSCT data (computer 10 has memory); and

a data processor for performing a filtered back-projection, wherein the data processor is adapted to perform the following operation:

determining a wave-vector transfer by using the first readouts (Col. 4, lines 17-38);

determining a reconstruction volume (view angle, fan angle and momentum transfer of scattering points); and

wherein a dimension of the reconstruction volume is determined by the wave-vector transfer (momentum transfer of scattering points).

Harding fails to disclose wherein the wave-vector transfer represents curved lines in the reconstruction volume; and

performing a filtered back-projection along the curved lines in the reconstruction volume.

Van Stevendaal et al. teaches wherein the wave-vector transfer represents curved lines in the reconstruction volume (Page 2468, Col. 2, lines 26-28 and Figures 3 and 4) and

performing a filtered back-projection along the curved lines in the reconstruction volume (Title and Abstract, lines 4-6).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the configuration of Harding to include the curved filtered back-projection of Van Stevendaal et al., since a person would have been motivated to make such a modification to reduce computational time and improve imaging by performing sub-field-of-view reconstruction (Abstract, lines 8-11) as taught by Van Stevendaal et al.

Hsieh teaches a computer readable medium encoded with a computer program wherein when implemented on the data processor, the program instructs the data processor to perform steps (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the configuration of Harding as modified above the computer readable medium of Hsieh, since person would have been motivated to make such a modification to more easily update existing systems to implement the invention (Col. 8, line 66 - Col. 9, line 1) as taught by Hsieh.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Schlomka et al. ("Coherent Scatter Computed Tomography – A Novel Medical Imaging Technique", 5 June 2003, Medical Imaging 2003: Physics of Medical Imaging, SPIE Volume 5030, pages 256-265) discloses the claimed apparatus and reconstruction method (Entire document).

Grass et al. ("3D cone-beam CT reconstruction for circular trajectories", 2000, Physics of Medicine in Biology, Volume 45, pages 329-347) discloses a computed tomography reconstruction method for circular trajectories (Abstract).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. CORBETT whose telephone number is (571)272-8284. The examiner can normally be reached on M-F 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. M. C./
Examiner, Art Unit 2882

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